

Riverdale Irrigation District

2015 Agricultural Water Management Plan

Prepared Pursuant to Water Code Section 10826
and Executive Order B-29-15

Riverdale Irrigation District
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Adopted on November 9, 2016

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Acronyms and Abbreviations

AF	acre-feet
AWMP	Agricultural Water Management Plan
Board	Board of Directors
BPO	Basin Plan Objective
cfs	cubic feet per second
Coalition	Kings River Water Quality Coalition
District	Riverdale Irrigation District
DWR	California Department of Water Resources
ET	evapotranspiration
GSA	Groundwater Sustainability Agency
GWMP	Groundwater Management Plan
IRWMP	Integrated Regional Water Management Plan
ITRC	California Polytechnic State University San Luis Obispo's Irrigation Training & Research Center
JPA	Joint Powers Authority
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
MDL	method detection limit
mg/L	milligrams per liter
NTU	Nephelometric Turbidity Unit
Plan	Agricultural Water Management Plan
PQL	practical quantification limit
RID	Riverdale Irrigation District
SGMA	Sustainable Groundwater Management Act
ug/L	micro grams per liter
umhos/cm	micro mhos per centimeter

Section I: Introduction

A. Conjunctive Use District

Riverdale Irrigation District is an agricultural irrigation district located in Fresno County, in California's San Joaquin Valley. The District is a conjunctive use district, meaning the surface water supply available to water users in the District must be augmented by groundwater use to meet total agricultural demands within the District. Use of flood irrigation methods are considered beneficial as water applied in excess of the crop evapotranspiration provides additional recharge to the local groundwater aquifer. The District delivers and beneficially uses all surface water that it is entitled to and receives. Depending on the surface water supply conditions each year, water supplies may be carried over in storage for use in a subsequent year, but all water is beneficially used. Accurate water delivery measurement is important to the District for equitable distribution of allocated water; however the District does not believe that the installation of meters will cause significant water conservation.

B. Description of Previous Water Management Activities

This Agricultural Water Management Plan (AWMP or Plan) has been prepared by Riverdale Irrigation District (RID or District) in accordance with the requirements of Senate Bill X7-7 (SBx7-7), the Water Conservation Act of 2009, and Executive Order B-29-15, issued by Governor Jerry Brown on April 1, 2015. This is the first AWMP prepared by the District. This AWMP has been prepared in accordance with the requirements identified in the Department of Water Resources (DWR) Guidebook to Assist Agricultural Water Suppliers to Prepare an Agricultural Water Management Plan dated June, 2015.

In 1995 the District prepared a groundwater water management plan (GWMP) in accordance with AB 3030, the Groundwater Management Act of 1992. The 1995 GWMP documented the groundwater management activities that the District has implemented throughout its existence, providing a framework for expanding groundwater management within the District. The GWMP contained the following recommendations:

1. Establishment of a groundwater level monitoring program,
2. Mitigation of groundwater overdraft,
3. Replenishment of groundwater extractions,
4. Facilitation of conjunctive use operations,
5. Development of relationships with state and federal regulatory agencies, and
6. Coordination with local agencies.

The purposes for preparing this AWMP for the District are to (1) document water management activities that the District has implemented throughout its existence and provide a framework for expanding water management within the District, (2) identify areas to improve the efficiency of water use within the District, (3) consider past and future water management strategies to increase the reliability of water deliveries to the

District, and (4) document the District's AWMP to its water users and other interested parties.

The District is a member as an interested party of the Kings Basin Water Authority, formerly known as the Upper Kings Basin Integrated Regional Water Management Authority, which initially prepared and subsequently updated the Kings Integrated Regional Water Management Plan (IRWMP). The vision of the Kings Basin Water Authority is a sustainable supply of the Kings River Basin's finite surface water and groundwater resources through regional planning that is balanced and beneficial for environmental stewardship, overall quality of life, a sustainable economy, and adequate resources for future generations. Fifteen measureable objectives were identified to help meet the region's five primary goals to:

1. Reduce groundwater overdraft,
2. Increase water supply reliability,
3. Improve water quality and drinking water reliability,
4. Enhance flood protection, and
5. Enhance ecosystems and the services they provide.

C. Coordination Activities

1. Notification of AWMP Preparation

Worksheet 1 provides a summary of specific interested parties that were notified and/or requested to provide some level of involvement in the 2016 AWMP during the public review process.

Worksheet 1. Summary of Coordination, Adoption, and Submittal Activities

Potential Interested Parties	Notified of AWMP Preparation	Requested Copy of Draft AWMP	Commented on Draft AWMP	Notified of Public Meetings	Copy of Adopted AWMP sent
Selma Enterprise				10/26/2016 & 11/2/2016	
County of Fresno				10/20/2016	
District Landowners/Water Users	March & April 2016 Board Meetings			10/26/2016	
DWR Website					11/10/2016
California State Library					11/10/2016

2. Public Participation

Prior to adopting the Plan, the District made the proposed Plan available for public inspection, and held a public hearing on the Plan on November 9, 2016. Prior to the hearing, notice of the time and place of hearing was published in a local newspaper and posted within the District and at the District office.

Exhibit 1 includes copies of the public notifications on the hearing time and place, copies of the notice of availability of the Plan for public review, and public comments that were received and considered prior to adoption.

D. Plan Adoption and Submittal

1. Plan Adoption

At the regular Board of Directors (Board) meeting held on November 9, 2016, the Board adopted the Plan. A copy of the Resolution of Plan Adoption is included in Exhibit 2.

2. Plan Submittal

After adoption, an electronic copy of the Plan was submitted to DWR and to the California State Library.

3. Plan Availability

A copy of the Plan was made available at the District office for review in addition to submitting the Plan to DWR and the California State Library. A copy will also be made available for public review on DWR's internet website.

E. Plan Implementation Schedule

The Board intends to implement the Plan in 2016 and subsequently update it on a five-year schedule beginning in 2020.

Section II: Description of the Agricultural Water Supply and Service Area

A. Physical Characteristics

1. History and Size of the Service Area

Riverdale Irrigation District is a public agency that was formed on April 19, 1920, to deliver agricultural irrigation water in southern Fresno County. The community of Riverdale lies in the eastern portion of the District and the much smaller community of Lanare lies near the center of the District. Located adjacent to the Fresno Slough on the southwest, District lands lie at or near the trough of the San Joaquin Valley floor. A three-member Board governs the District. Board members must be landowners in the District or a designated representative of a landowner.

The District is comprised of 14,879 acres, with approximately 14,200 acres able to be supplied with surface water for agricultural production. The balance of the land is undeveloped, operated as livestock facilities, right of ways, or areas where deliveries from the District are, for various reasons, not feasible.

The District is a member of the Murphy Slough Association (MSA), which is a water rights holder on the Kings River. The District is a fifty percent (50%) member of the MSA, and therefore is entitled to 50% of the MSA's allocation of Kings River water.

The District's entire surface water supply comes from the Kings River. Kings River water is divided among the member units of the Kings River Water Association (KRWA) based on an allocation schedule. The District's allocated share of storage at Pine Flat Reservoir and other reservoirs in the Kings River Watershed is approximately 26,240 acre feet. Surface water is stored in Pine Flat and diverted from the Kings River for distribution through the District's canals and other facilities. Water flowing down the canals also recharges the groundwater basin or aquifer. The diverted water is used for surface irrigation on approximately 14,200 acres of cropland in the District. Kings River water rights holders, like the District, depend primarily on snowfall that accumulates in the Sierra Nevada Mountains in the winter that melts in the spring and summer months and the runoff is stored in Pine Flat Reservoir for later use. In addition to irrigation use, part of the diverted surface water can also be delivered to several basins for recharge.

The District's annual entitlement of Kings River water from the MSA has averaged approximately 30,000 acre-feet (AF). Over the last ten years (2007-2016), which has been a drier than normal period, the average annual surface water diversions were approximately 15,000 acre-feet (AF), but have varied from a low of 0 AF in 2013 and 2015, to a high of a little over 44,000 AF in 2011. In most years the District does not have enough surface water to meet all crop demands, and growers must supplement the available surface water with privately pumped groundwater.

The majority of the water demand is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater.

Surface water delivered to agriculture reduces the reliance on groundwater. Part of the surface water applied to agriculture, that water which is not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of the District's conjunctive use operations.

Historically, in flood years on the Kings River when surface water is abundant, the District takes advantage of that available water and delivers as much water as possible to water users and also recharges the groundwater aquifer throughout the District as much as possible for use by growers in subsequent dry years. The District owns and operates two regulation/recharge reservoirs in the District where water can be captured to recharge groundwater or temporarily held and reused as surface water.

Due to the variable and unpredictable nature of the District's surface water supply, conjunctive use is a very important part of District operations. Surface water irrigation must be supplemented with groundwater to meet the annual water demands of the crops. The District does not operate any groundwater wells, but its landowners use their own groundwater wells to supply water for their crop needs when surface water supplies are not available.

The District is unique in the Lower Kings River Sub-Basin because its groundwater supply is fairly stable under normal hydrologic conditions. Due to the proximity to the Kings River and fairly permeable soils within the District, the conditions allow for efficient replenishment of groundwater aquifers in wet years after drought cycles.

2. Location of the Service Area and Water Management Facilities

The District is located in southern Fresno County and surrounds the communities of Riverdale and Lanare. The District's northern boundary is generally along Murphy Slough, the western boundary is the Fresno Slough, and its southern border is shared with Laguna Irrigation District. Refer to Exhibit 3 for a location map and Exhibit 4 for a distribution system map of the District.

The District has an extensive distribution system of canals. The 27 miles of unlined canals range in capacity from 200 cubic feet per second (cfs) down to less than 10 cfs. Because of the broad system of canals, all landowner diversions are currently made from District-owned facilities through 108 active turnouts. All water enters the District through the Riverdale Ditch and measurements are taken where it enters the Ditch near Fruit Avenue. Due to the placement of the delivery system, approximately 90 percent of the District can be supplied with surface water. Refer to Exhibit 4 for a distribution system map of the District and Worksheet 2 for the itemized water distribution system inventory.

Worksheet 2. Water Conveyance and Delivery System

Supply Canals	Length (mi)
Earth Lined Canals	27
Lined Canals	0
Bottom-only Lined Canals	0
Pipelines	0
Total	27

The District's main function is to provide surface water deliveries for irrigation to its landowners, utilizing the District water delivery system. The annual duration and quantity of water deliveries varies each year based on the storage conditions in Pine Flat Reservoir and on runoff in the Kings River watershed. While the District has the ability to run available water whenever needed, the District typically delivers its water during the "coordinated water run" in conjunction with neighboring districts to minimize river seepage losses. Typically, surface water supplies are made available in the months of June, July and August. During drier hydrologic conditions, the surface water supplies are provided over a shorter period of time or not at all, and in above average water years the irrigation season can be six (6) months or longer.

The other secondary service provided by the District is groundwater recharge, which can be provided by two methods: direct recharge and in-lieu recharge. Direct recharge occurs through seepage from the earthen channels when they are used for water delivery and in utilizing dedicated regulation/recharge basins. The District has two reservoirs within its boundaries. One, adjacent to the Burrel Ditch approximately ½ mile south of Mt. Whitney Avenue, is operated primarily as a regulation reservoir but also serves as a source of groundwater recharge. A small, low head lift pump is used to deliver water back into the canal for reuse. A second reservoir, at the end of the Turner Ditch, is used as a terminal reservoir to catch any excess water from the ditch before it spills into the North Fork of the Kings River, with most of the captured water stored and used for groundwater recharge. The Burrel Ditch reservoir has a surface area of approximately 5 acres and can store approximately 60 acre-feet of water, while the Turner Ditch terminal reservoir has a surface area of approximately 10 acres and can store approximately 200 acre-feet of water. In addition, the Murphy Slough Association, of which the District is one-half of the membership, has several recharge ponds adjacent to the Murphy Slough just outside the District boundaries that are used to store and recharge floodwater when it is available.

In-lieu recharge in the District occurs when growers use surface water instead of groundwater. By foregoing pumping, groundwater can remain in storage or it can be used by other growers that do not have access to surface water or by municipalities that cannot use untreated surface water.

The groundwater recharge benefits provided by the District are realized by users both inside and outside the District boundaries. District water users that are able to receive surface supplies can also augment their irrigation water needs by operating their private wells when the District is not providing surface water.

3. Terrain and Soils

Land in the District generally slopes from east to west at three to four feet per mile, with local variations caused by remnants of slough channels. Elevations range from 200 to 225 feet above sea level.

Soils in the District are predominantly loams, ranging from sandy loam to clays, and some soils are saline-alkali. Soils in the western portion of the District generally have a higher clay content, and this is also where the saline-alkali soils tend to occur. Soils within the region were deposited in the valley trough during flood periods and are derived from mixed granitic and sedimentary rocks from both the Sierra Nevada and Coast Range mountains. Soils in the eastern portion of the District tend to have a higher sand content and are derived mostly from granitic Sierra Nevada sediments deposited on alluvial fans. Soils throughout the region are stratified, with interspersed sandy and clay streaks.

Worksheet 3 lists the names and generalized descriptions for soils found in the District. As shown in the table, over 95% of the District is comprised of soils that have a Land Capability Classification of 2 or better; the remainder of the soils are generally poorly drained or more severely sloped, and are generally not farmed. Refer to Exhibit 5 for a soils map of the District.

Worksheet 3. Landscape Characteristics

Map Symbol/Soil Name ¹	% of District	Percolation Rate (inch/hour)	Land Capability Classification	Soil Description
Chino loam	18.45	0.20-0.57	1	Deep, somewhat poorly drained
Temple loam	13.15	0.20-0.57	1	Deep, poorly drained
Temple clay loam	13.01	0.20-0.57	1	Deep, poorly drained
Temple clay loam, saline-alkali	9.93	0.20-0.57	2	Deep, poorly drained
Foster sandy loam	9.69	0.20-0.57	2	Deep, poorly drained
Temple loam, saline-alkali	9.65	0.20-0.57	1	Deep, poorly drained
Chino loam, saline-alkali	4.75	0.20-0.57	2	Deep, somewhat poorly drained
Merced clay loam	4.29	0.06-0.20	2	Deep, very poorly drained
Chino sandy loam	4.15	0.20-0.57	1	Deep, somewhat poorly drained
Foster loam	2.64	0.20-0.57	2	Deep, poorly drained
Chino sandy loam, saline-alkali	1.99	0.20-0.57	2	Deep, somewhat poorly drained
Temple loam, saline	1.87	0.20-0.57	2	Deep, poorly drained
Grangeville sandy loam	1.77	0.20-0.57	2	Deep, somewhat poorly drained
Other	4.66		>2	Deep, poorly drained

¹ USDA NRCS Web Soil Survey of Eastern Fresno Area, California, accessed June 2016.

4. Climate

The District's regional climate is semi-arid with hot, dry summers and mild winters. Average daily temperatures vary from average lows of 34°F in December to average highs of 96°F in July, with typical diurnal ranges of 33°F in the summer to 22°F in the winter. Annual precipitation from 1983 through 2015 averaged 7.73 inches, with 92 percent of the total rainfall received between October and April. Refer to Worksheet 4 for climatology for selected periods.

Worksheet 4. Detailed Climate Characteristics

Month	Average Precipitation, Inches ¹	Average Reference Evapotranspiration (ET _o), Inches	Average Maximum Temperature, °F	Average Minimum Temperature, °F
January	1.48	1.18	56	36
February	1.46	2.13	63	39
March	1.26	4.10	69	43
April	0.51	6.05	76	46
May	0.28	8.17	84	52
June	0.05	8.93	91	58
July	0.05	9.00	96	63
August	0.07	8.10	95	61
September	0.13	6.17	90	57
October	0.67	4.20	81	49
November	0.48	2.13	67	39
December	1.28	1.16	56	34
Annual	7.73 Total	61.31 Total	77 Average	48 Average
Wet Season (Oct-Apr)	7.15 Total	20.95 Total	68 Average	41 Average
Dry Season (May-Sep)	0.58 Total	40.36 Total	91 Average	58 Average

¹ CIMIS Station 15 (Stratford) from 1983-2015.

B. Operational Characteristics

1. Operating Rules and Regulations

Refer to **Error! Reference source not found.** for a copy of the District's Rules and Regulations, which govern District operations.

2. Water Delivery Measurements or Calculations

The entire District water supply is measured as it enters the District through the Riverdale Ditch. District water is diverted from the Kings River into Murphy Slough, and from Murphy Slough the water is diverted into the Riverdale Ditch. The District participates in the ownership and operation of Murphy Slough via membership in the MSA. Other MSA members are Liberty Mill Race Company (1/3) and Reed Ditch

Company (1/6). The District makes up the other ½ of MSA. Within the District the delivery system subdivides into smaller ditches and ultimately water is delivered to grower farm-gate turnouts and private facilities.

The flow of water in the distribution system is controlled in most cases by overflow weirs or check structures, and the ditchtenders periodically estimate the flow of water in the canals by converting head measurements over the weir boards to flow rates at periodic control structures within the District.

During the irrigation season, farmers order water directly from their assigned ditch tender. A farm turnout may receive water for periods ranging from a fraction of a day to several weeks per delivery cycle depending on the acreage served by that turnout and the type of irrigation system being utilized.

The growers arrange in advance with the ditch tenders when to open and close their valves for a delivery. Farmers operate the turnout valves themselves. This relatively low-cost method of water delivery has worked successfully for many decades.

There are no turnout measurements done at this time; the District water is measured by control structure head measurements when it is put in the Riverdale Ditch system at Fruit Avenue, and then periodic measurements are made throughout the distribution system. District ditchtenders have experience in estimating the rate of water delivery being diverted through on-farm turnouts, and can distribute water to the water users within the District accordingly.

Refer to Worksheet 5 for a summary of the District's water measurement devices and frequency of measurement when water is being delivered.

Worksheet 5. Water Delivery Measurements

Measurement Device	Frequency of Measurement (Days)	Frequency of Calibration (Months)	Frequency of Maintenance (Months)	Estimated Level of Accuracy
Flumes	Daily	As needed	As needed	± 5%
Weir boards	Daily	As needed	As needed	± 10%

3. Water Rate Schedules and Billing

The District recovers its operating expenses through acreage assessments on lands within the District. Therefore, the District's annual income is essentially fixed regardless of the amount of water that is delivered. There are three primary assessment rates which are based on the type of water service available. The current rates are listed below in Worksheet 6.

Worksheet 6. Water Rate Basis

Water Service	Description	Valuation	2016 Assessment (\$18/\$100 value)
Irrigation	Surface deliveries	\$150/acre	\$27.00/acre
Pump	Well only	\$75/acre	\$13.50/acre
Pasture	Forage	\$45/acre	\$8.10/acre
Lot	<1 acre	\$7/lot	\$7.00/lot

The District Irrigation rate is for users that are able to receive surface water supplies from the District. The Pump rate is for users that are not able to receive surface supplies and only irrigate using their private groundwater well pumps. The District Irrigation rate is higher than the Pump rate because the service provided to the District Irrigation rate users is more valuable than the service to Pump users. To obtain a given annual volume of irrigation water, a District Irrigation rate user would not have to operate his private well as often as a Pump rate user needing the same annual amount of water. A typical water run for the District Irrigation rate users may last approximately three months.

4. Water Shortage Allocation Policies

Each year the District determines the available water supply by considering the projected Kings River runoff and the amount of water in storage in Pine Flat Reservoir. The District then allocates all available water on a per acre basis to its landowners based on the acreage eligible to receive surface water. Because of the variable nature of the District water supply, the amount of water received by a water user typically varies each year. In a water shortage, all landowner allocations are reduced equally.

The District's Rules and Regulations Governing the Distribution of Water (**Error! Reference source not found.**) addresses the allocation of District water supplies:

When sufficient supply makes it possible, water will be delivered on request. The water deliveries are scheduled on first come, first served basis after requests to the individual Ditchtender from the water users are approved. When there is insufficient supply, or disputes between water users exist, a rotation schedule will be prepared by the Manager or District Agent for that particular canal or lateral.

When land has received one irrigation turn during a season, a second irrigation turn will be allowed only after all other irrigable land within the District that has requested water has been irrigated. During a season when a shortage is predicted, the water may be prorated among water users.

Rule 18 of the District's Operating Rules and Regulations addresses the wasteful use of District water supplies and describes enforcement methods:

Water users are responsible for the efficient use of water received. Those water users who waste water through carelessness, defective, or inadequate privately owned facilities, or because of inadequate land preparation, may be refused further water service until such conditions are remedied. And waste or improper use of water shall be reported to the Manager.

Water users shall be responsible for all water after it leaves any canal, ditch, conduit, or other structure owned by the District. The District shall not be responsible or liable for any damage caused by negligence or careless use of water by any water user or by any water user's failure to maintain any canal, ditch, pipeline or other facility for which he is wholly or in part responsible. It is incumbent on all water users to prevent hazardous conditions, mosquito nuisances, or damage to the property of others.

Section III: Description of Quantity of Water Uses

A. Agriculture Water Use

The representative year used in the remainder of the worksheets in this Plan is 2012. This year was chosen because in the previous 5 years, 2012 was closest to “normal”, with 2011 being a flood year and the period 2013-2015 being the driest 3-year period of Kings River runoff on record.

Worksheet 7. Annual Agricultural Water Use (AF)

Source	2012	2013	2014	2015
Agricultural Water Supplier Delivered				
Surface Water ¹	8,610	0	4,410	0
Other Water Supplies Used				
Effective Precipitation	1,087	0	2,628	1,004
Estimated Groundwater	31,335	41,032	33,994	40,028
Total ²	41,032	41,032	41,032	41,032

¹ From Worksheet 13.
² Total estimated average crop demand from Worksheet 8.

Worksheet 8. Agricultural Crop Data

Crop	Total Acreage ¹	ET crop ² (AF/Ac)	Leaching ³ Requirement (AF/Ac)	Cultural ⁴ Practices (AF/Ac)	Total Crop Water Needs (AF/Ac)
Pistachios	3,366	2.88	0.12	0.00	3.00
Alfalfa	3,045	3.71	0.15	0.00	3.86
Corn	2,692	2.38	0.14	0.00	2.52
Grain	960	1.57	0.16	0.00	1.73
Cotton	904	3.64	0.36	0.00	4.00
Almonds	726	3.27	0.23	0.13	3.63
Forage	504	3.77	0.15	0.00	3.92
Pomegranates	351	2.99	0.12	0.00	3.11
Grapes	174	2.30	0.09	0.00	2.39
Onions	172	1.66	0.08	0.00	1.74
Tomatoes	118	2.00	0.14	0.00	2.14
Safflower	100	2.19	0.26	0.00	2.45
Peaches	60	3.16	0.28	0.13	3.57
Total Irrigated	13,173	38,852	2,078	102	41,032

¹ 2012-2015 average from GIS data from Fresno County Agricultural Commissioner's Pesticide Use records.
² Crop ET obtained from Etc Table for Irrigation District Water Balances, ITRC, Zone 12 for surface irrigation in a typical year.
³ Leaching requirement developed from Journal of Irrigation and Drainage Division data to maintain 100% yield potential.
⁴ Includes frost protection water.

B. Environmental Water Use

The District is a party to an effort to maintain the Kings River Fishery through the KRWA. Known as the Kings River Fisheries Management Program, the program is a cooperative effort between KRWA, the Kings River Conservation District (KRCD) and the California Department of Fish and Wildlife. The District has agreed, along with other Kings River water rights holders, to divert water from storage to maintain minimum flows within the river channel. The program has been in place since 1999.

C. Recreational Water Use

No recreational resources are supported by the District's water supplies.

D. Municipal and Industrial Use

No municipal and industrial resources are supported by the District's water supplies. The communities of Riverdale and Lanare, while largely excluded from Riverdale ID, are wholly contained within District boundaries. These communities operate municipal water systems, utilizing groundwater as their sole water supply.

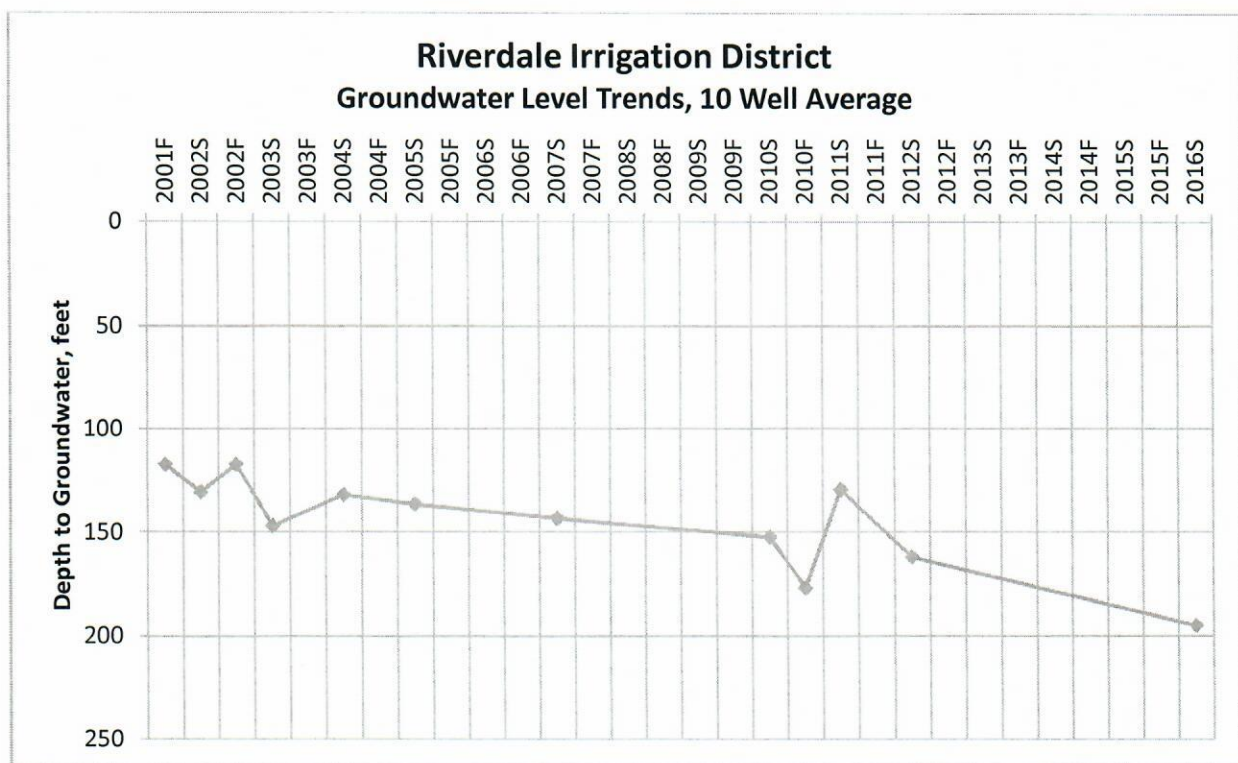
E. Groundwater Recharge Use

Some groundwater recharge occurs each year when water is delivered through the unlined canal distribution system, but the amount of this recharge is not directly quantifiable and is estimated by accounting for losses from the water balance. Delivery to basins for recharge primarily occurs in years when floodwater is available. The previous years that floodwater was available were 2011 and 2006. There were no water deliveries in 2013 or 2015.

Worksheet 9. Groundwater Recharge Water Use (AF)

Source	2012	2013	2014	2015
Various Riverdale ID canals	1,520	0	778	0
Recharge from Basins	0	0	0	0
Total	1,520	0	778	0

Even though the District does not own or operate any groundwater wells, the District does monitor groundwater levels at 10 different locations within the District. Below is a graph that indicates the average groundwater level trend within the District over the past 15 years. The District is a member of the North Fork Kings groundwater group that is in the process of establishing a Groundwater Sustainability Agency (GSA) to comply with the Sustainable Groundwater Management Act (SGMA). It can be seen in the groundwater trend graph that water levels decline during drier periods and generally recover in above normal water years like 2011.



F. Transfer and Exchange Use

The District typically delivers all water for irrigation use that it is entitled to, but has periodically offered water for exchange or one-time sale with other Kings River water entities and allows common landowner transfers within the Kings River Service Area upon request. Any water that is transferred is not included in the Worksheet calculations, as the supply does not enter and then exit the District's service area.

Section IV: Description of Quantity and Quality of the Water Resources of the Agricultural Water Supplier

A. Water Supply Quantity

1. Surface Water Supply

The District has water rights to the flow of the Kings River and storage rights in Pine Flat Reservoir. Surface water is stored in Pine Flat and diverted from the Kings River into Murphy Slough for distribution through the District's canals. Water flowing down the canals also recharges the groundwater basin. The diverted water is used for surface irrigation on approximately 14,200 acres of cropland. In most years surface water irrigation must be supplemented with groundwater to meet the annual water demands of the crops. The remaining agricultural areas of the District rely exclusively on groundwater, as do the communities of Riverdale and Lanare. The District's annual entitlement of Kings River water has averaged around 30,000 acre-feet (AF) which can be delivered in the year generated or stored in Pine Flat Reservoir for use in subsequent years subject to the reservoir flood control criteria. Over the last ten years, which has been a drier than normal period, the average annual surface water diversions were approximately 15,000 acre-feet (AF), but have varied from a low of 0 AF in 2013 and 2015, to a high of a little over 44,000 AF in 2011. Worksheet 10 summarizes water deliveries for the representative year 2012 and years 2013-2015.

Worksheet 10. Surface Water Supplies (AF)

Source	2012	2013	2014	2015
Headgate Diversions	10,130	0	5,188	0
Conveyance/Evaporation Losses	(1,520)	0	(778)	0
Total Supply	8,610	0	4,410	0

2. Groundwater Supply

The District does not own or operate any groundwater wells. All groundwater pumping is from landowners using private groundwater wells.

Worksheet 11. Groundwater Supplies (AF)

Source	2012	2013	2014	2015
The District does not currently own/operate any wells. Estimated private pumping (from Worksheet 7).	31,335	41,032	33,994	40,028
Total Estimated Private Pumping	31,335	41,032	33,994	40,028

3. Other Water Supplies

The District has no other water supplies.

4. Drainage From the Water Supplier's Surface Area

Landowners are required by the District to maintain applied water on their lands - privately operated tailwater/spill recovery systems are in place to accomplish this element of water management. Subsurface drainage systems are not required within the District since there are no shallow groundwater problems.

B. Water Supply Quality

1. Surface Water Supply

Surface water within the Kings River watershed continues to meet or exceed Basin quality standards. Kings River water is of excellent quality for irrigation and has shown no significant water quality issues since implementation of the surface water monitoring and data collection program. There have been no water quality problems that limit the use of the Kings River water within the District. Worksheet 12 provides recent water quality data.

Worksheet 12. Water Supply Quality

2014 Kings River Water Quality Data From KRCD for Gould Canal location (upstream of RID headgates)						
Constituent	BPO	MDL	PQL	Units	Min	Max
Flow				cfs	30	120
EC	700			umhos/cm	28	53
EC dup	700			umhos/cm	27.2	53.1
pH	6.5-8.3			pH	6.72	7.5
pH dup				pH	6.83	7.43
Temperature	var			Celsius	9.2	23.1
Temperature dup				Celsius	9.2	23
Dissolved Oxygen	5 & 7			mg/L	8.65	11.37
Dissolved Oxygen dup				mg/L	8.34	11.29
TDS	450	4.4	10	mg/L	20	32
Turbidity	var	0.035	0.1	NTU	0.38	1.2
Nitrate-Nitrite N		0.02	0.05	mg/L	ND	0.14
Orthophosphate-P		0.006	0.01	mg/L	ND	0.015
Color			1	APHA	5	15
Phosphorus		0.007	0.01	mg/L	0.018	0.044
Boron	700	0.7	10	ug/L	12	20
Cadmium	var	0.04	0.1	ug/L	ND	0.071 B J
Zinc	var	0.7	1	ug/L	1.1	2.8
Molybdenum	10	0.07	0.5	ug/L	1.6	3.2

C. Water Quality Monitoring Practices

1. Source Water

Surface water quality measurements have been collected as part of the Central Valley Regional Water Quality Control Board (RWQCB) Irrigated Lands Regulatory Program

(ILRP) since the program's inception in 2006. This data has been collected by KRCD staff or agents acting on behalf of the Kings River Water Quality Coalition (Coalition). The Coalition was established on January 1, 2009 as a Joint Powers Agency (JPA) by and between the public agencies and mutual water companies within the Kings River service area. Each of the parties to this Agreement administer and/or deliver irrigation water to growers in or adjacent to the service area of the Kings River in the San Joaquin Valley. As a result, they are vitally interested in preserving the viability of irrigated agriculture within their respective service areas and the watershed as a whole. The Coalition was formed in order to combine resources and reduce the cost of compliance with the Tulare Lake Basin General Order.

The water quality data for the constituents shown in Worksheet 12 is obtained from water samples collected by consultants working for the Coalition and is typical of the data collected on a monthly basis at various locations along the Kings River.

Section V: Water Accounting and Water Supply Reliability

A. Quantifying the Water Supplier's Water Supplies

Worksheet 13 illustrates the District's water supplies in the representative year 2012 and years 2013-2015.

1. Agricultural Water Supplier Water Quantities:

Worksheet 13. Surface and Other Water Supplies (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012 Supply:													
Headgate Diversions	0	0	0	0	0	1,358	8,772	0	0	0	0	0	10,130
Deliveries:													
To Farms	0	0	0	0	0	1,154	7,456	0	0	0	0	0	8,610
To Recharge Basins	0	0	0	0	0	0	0	0	0	0	0	0	0
2013 Supply:													
Headgate Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Deliveries:													
To Farms	0	0	0	0	0	0	0	0	0	0	0	0	0
To Recharge Basins	0	0	0	0	0	0	0	0	0	0	0	0	0
2014 Supply:													
Headgate Diversions	0	0	0	0	0	0	5,188	0	0	0	0	0	5,188
Deliveries:													
To Farms	0	0	0	0	0	0	4,410	0	0	0	0	0	4,410
To Recharge Basins	0	0	0	0	0	0	0	0	0	0	0	0	0
2015 Supply:													
Headgate Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Deliveries:													
To Farms	0	0	0	0	0	0	0	0	0	0	0	0	0
To Recharge Basins	0	0	0	0	0	0	0	0	0	0	0	0	0
All water deliveries were for irrigation purposes.													

2. Other Water Sources Quantities:

Worksheet 14. Effective Precipitation Summary (AF)

	2012 Effective Precipitation		2013 Effective Precipitation		2014 Effective Precipitation		2015 Effective Precipitation	
	(in)	(AF)	(in)	(AF)	(in)	(AF)	(in)	(AF)
January	0.00	0	0.00	0	0.00	0	0.00	0
February	0.00	0	0.00	0	0.66	728	0.10	109
March	0.32	351	0.00	0	0.00	0	0.00	0
October	0.07	81	0.00	0	0.35	387	0.19	213
November	0.07	81	0.00	0	0.02	25	0.33	359
December	0.71	778	0.00	0	1.24	1356	0.70	771
Total	1.17	1,289	0.00	0	2.27	2,496	1.32	1,452
From: Calculation based on method developed by MacGillivray, N.A. and M.D. Jones, 1989, "Effective Precipitation", California Department of Water Resources. 2013 total precipitation did not yield any effective precipitation according to this method of calculation.								

B. Quantification of Water Uses

Worksheet 15. Applied Water (AF)

	2012	2013	2014	2015
Applied Water (from Worksheet 7)	8,610	0	4,410	0

Worksheet 16. Quantify Water Use (AF)

Water Use	2012	2013	2014	2015
Crop Water Use (from Worksheet 7)				
Crop Evapotranspiration	38,852	38,852	38,852	38,852
Leaching	2,078	2,078	2,078	2,078
Cultural Practices	102	102	102	102
Conveyance & Storage System				
Conveyance seepage and evaporation	1,520	0	778	0
Conjunctive Use				
Groundwater Recharge (from Worksheet 9)	0	0	0	0
Total	42,552	41,032	41,810	41,032

C. Overall Water Budget

Worksheet 17. Quantify Water Supplies (AF)

Water Supplies	2012	2013	2014	2015
Surface Water (summary total from Worksheet 13)	10,130	0	5,188	0
Groundwater Pumping (from Worksheet 7)	31,335	41,032	33,994	40,028
Annual Effective Precipitation (summary total from Worksheet 14)	1,087	0	2,628	1,004
Total	42,552	41,032	41,810	41,032

Worksheet 18. Budget Summary (AF)

Water Accounting	2012	2013	2014	2015
Subtotal of Water Supplies (from Worksheet 17)	42,552	41,032	41,810	41,032
Subtotal of Water Uses (from Worksheet 16)	42,552	41,032	41,810	41,032
Excess Deep Percolation	0	0	0	0

D. Water Supply Reliability

Based on an evaluation of the District's historical deliveries for the last 10 years, which has been a below average water supply period, the District has delivered an average of approximately 15,000 AF per year.

E. Drought Management

As a conjunctive use district with a highly variable surface water supply, the District and its water users are constantly juggling supply and demand and landowners must pump groundwater to make up for the deficit between demand and available surface water supplies. All available surface water is typically delivered by the District for irrigation use each year. In accordance with the Rules and Regulations, the District allocates all available water supply each year among water users whose lands are classified as Irrigation Rate (and are not delinquent on any payments) on a pro-rata equal amount per acre in so far as practical. In most years, there is usually more demand for surface water than there is supply, so proper water management is critical. Water users in the District must have a private deep groundwater well in order to supplement surface water available from the District. In drought and below normal water years the regional groundwater level tends to decline because of increased pumping, and in above normal surface water supply years the groundwater levels generally recovers. The District maximizes surface water delivery to growers each year, including the capture and use of floodwater during wet years.

The communities within the District are solely dependent on groundwater, and municipal use affects the regional water balance and overall groundwater conditions. The communities of Riverdale and Lanare are part of the proposed North Fork Kings GSA along with the District, and one of the goals of the GSA will be to implement projects in the future that will help correct groundwater overdraft and allow for improved reliability of water during dry periods.

The District provides early communication to growers regarding drought conditions and the anticipated water supply available to District growers each year so landowners can plan accordingly. The District also maintains an extensive groundwater monitoring network and information regarding the annual groundwater levels is available on request.

Section VI: Climate Change

"In the most general sense, climate change is the long-term change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It is well documented and widely accepted that the Earth's climate has fluctuated and changed throughout history. Global warming is the name given to the increase in the average temperature of the Earth's near-surface air and oceans that has been observed since the mid-20th century and is projected to continue. Warming of the climate system is now considered to be unequivocal (International Panel on Climate Change 2007). Global warming, therefore, refers to a specific type of rapid climate change occurring over the last 60 years and projected to continue into the future which falls outside of the normal range of historic climate variation." – Climate Change Handbook for Regional Water Planning.

The California Department of Water Resources (DWR) estimates indicate that by 2050 the Sierra Nevada snowpack, which provides 65 percent of California's water supply including the Kings River water supply, will be significantly reduced. Much of the precipitation is expected to fall as rain instead of snow during winter, which would increase the need for water storage. The climate is also expected to become more variable and extreme, bringing more droughts and floods.

All Kings River water users, including the District, will need to consider these potential climate change effects, many of which are already documented in various reports. Anticipated shorter winters, more hot days and nights, and a longer irrigation season will likely increase water demand in the District, and increase competition for water by others. Reduced snowpack and shifting spring runoff to earlier in the year has the potential to impact water supply on the Kings River and may cause need for greater storage and groundwater recharge in the area.

Water Demand

Water users receiving Kings River water generally hold much of their water in storage behind Pine Flat Dam for delivery during the coordinated summer irrigation run period. The intent of the summer water run is to provide the most effective and efficient method of water delivery when local demands are at their peak. In the summer the majority of water consumed in the region is applied towards irrigating crops. Surface and groundwater demands are very low in the winter months during which time most permanent crops are dormant, a large percentage of row crop farmland is idle, and typical winter precipitation provides most of the needed moisture. Historically, water users have been able to supplement surface water supplies with groundwater, resulting in continuous and uninterrupted availability of water.

However, with or without the future impacts from climate change the region will continue to struggle to meet water demands without the addition of new groundwater and surface water storage projects. Water conservation and irrigation management will also help reduce water demands. The seasonal component of water demands (e.g., irrigation and other water uses) will likely increase with climate change as droughts are expected to

become more common and more severe, temperatures alter evapotranspiration rates, and growing seasons become longer.

Water Quality

Surface water in the region predominately comes from Sierra snowmelt and is cold and of extremely high quality. Local surface water supplies are able to meet all beneficial uses, which include agricultural, industrial, recreation, aquatic habitat and municipal water use. If future climate impacts result in more frequent flood events then flood water will become more readily available for groundwater recharge. This would allow for the capture of extremely high quality surface water and improve the existing groundwater quality in the region. Agricultural management practices and irrigation management will also continue to play an important role in the improvement of water quality. Anticipated higher water temperatures may exacerbate reservoir water quality issues associated with dissolved oxygen levels; and increased algal blooms.

Adaptation Measures

The District has adopted the Kings Integrated Regional Water Management Plan (Kings IRWMP) which includes a chapter on climate change including a vulnerability assessment. The Kings Integrated Regional Water Management Authority is a collaborative effort amongst 53 public, private and non-governmental agencies to manage water resources within the region. Riverdale Irrigation District serves as an interested party to the Authority. As part of the plan, a workgroup was formed to address climate change adaptation and concluded that no-regret strategies should comprise the majority of adaptation measures. The following management strategies were deemed the most practical and effective for climate change adaptation in the Kings Basin:

- Improve urban and agricultural water efficiency,
- Increase use of recycled water (where energy efficient),
- Revise land use planning policies to encourage conservation,
- Develop groundwater recharge and banking projects to eliminate or reduce groundwater overdraft,
- Develop storage project inside and outside of the Kings Basin,
- Increase ability to capture floodwater both for flood control and water supply,
- Restore mountain meadows, wetlands, and riparian areas to regulate flows resulting in more summer runoff, and
- Consider changing crop types to accommodate climate change as necessary.

Potential Future Conditions

The Kings River Service Area has a reliable water supply, largely because groundwater is a dependable backup supply during droughts and dry season. However, groundwater levels may continue to decline as a result of below normal snowpack and increased groundwater demands if climate change reduces precipitation or causes earlier spring run-off that cannot be stored. If groundwater levels decline too much then groundwater will become a less reliable supply, and groundwater quality may also be adversely impacted. Susceptibility to climate change can be measured with several parameters

including groundwater overdraft, groundwater level decline, groundwater remaining in storage, and changes in well yields.

Adaptation to climate change within the agricultural sector is likely to occur naturally in response to economic signals that are driven by public policy, market conditions and the availability of irrigation water supply. As a result of existing and anticipated future pressures, growers will likely increase their use of water use efficiency products in the future where applicable, such as drip irrigation or micro sprinkler systems. The net effects of climate change on total runoff volumes and water demands are still unclear and highly uncertain.

Higher air temperatures could reduce losses for some crops based on fewer occurrences of winter freezes, but may negatively impact other crops that rely on winter freezes to kill pests and trigger effective dormancy. Higher air temperatures could also result in lower yields. Currently there are no adaptation measures available for these impacts, other than changing crop types, which may not be economically viable if permanent crops are impacted.

Monitoring

The Kings Basin has an extensive network for monitoring the hydrology, meteorology, water supply and water demands in the region. Monitoring programs are continually evaluated and upgraded, and the need for improvements to assess climate change will also be periodically evaluated. Even though certain changes with respect to hydrology are unclear based on some scientific models as to whether the region will have a wet or dry future climate, future projects will continue to be sought out based on historical hydrology until more decisive predictions are available.

Section VII: Water Use Efficiency Information

A. EWMP Implementation and Reporting

The District has either already implemented the 14 “conditional” EWMPs identified in Water Code §10608.48 that are cost effective and technically feasible for a conjunctive use district, or implementation is on-going.

Report of EWMP Implementation

Worksheet 19. Report of EWMPs Implemented/Planned		
EWMP No.	Description of EWMPs Implemented	Description of EWMPs Planned
Critical EWMPs		
1-Water Measurement	Measurements are made in the canal system. Ditchtenders estimate water deliveries at farm turnouts.	Installation of water meters at farm turnouts is being investigated to help increase the equitable distribution of water..
2-Volume-Based Pricing	Not implemented.	Not planned. Volume based pricing can disincentivize use of surface water, which has a negative impact on a conjunctive use district..
Conditional EWMPs		
1-Alternate Land Use	No Authority to impose land restrictions on customers.	
2-Recycled Water Use	No sources in RID service area	
3-On Farm Irrigation Capital Improvements	District has no funding for such improvements, but supports NRCS and grower financing of such improvements.	
4-Incentive Pricing Structure	In place.	
5-Infrastructure Improvements	Not applicable.	
6-Order/Delivery Flexibility	The delivery system operates as a unit. As one delivery ends, another begins. Water deliveries are coordinated with ditchtenders.	
7-Supplier Spill and Tailwater Systems	Riverdale ID uses regulation ponds to collect excess water. The water can then be returned to the system or used for recharge.	
8-Conjunctive Use	Riverdale ID is a conjunctive use district.	The District will evaluate additional opportunities for additional groundwater recharge to increase the conjunctive use.
9-Automated Canal Controls	Riverdale ID does not currently have any automated canal controls.	The District will evaluate the need for automated control structures. The cost of a canal control system must be compared to the potential benefit of such a system.

Worksheet 19. Report of EWMPs Implemented/Planned		
EWMP No.	Description of EWMPs Implemented	Description of EWMPs Planned
10-Customer Pump Test/Evaluation	District facilitates KRCD provided customer pump testing and evaluations upon request.	
11-Water Conservation Coordinator	Riverdale ID's Water Conservation Coordinator is Frank Thomas.	
12-Water Management Services to Customers	District facilitates KRCD provided water management services to our customers.	
13-Identify Institutional Changes	In place.	
14-Supplier Pump Improved Efficiency	No District Owned Groundwater Wells.	

Critical EWMP 1 – Water Measurement

The District currently measures all water diverted into the District from the Kings River, and KRWA also provides calibrated measurement of deliveries into the system. The District has also implemented periodic measurement at critical locations within the District, including measurement over check structures.

The District has previously investigated the installation of Water Specialties open flow propeller type meters at grower turnouts, and may revisit the installation of meters in the future. Implementation of measurement at the farmer turnout that meets the State SBx7-7 required accuracies has been determined to not be cost effective for the District at this time. In a conjunctive use district like RID where the amount of surface water received is not enough to satisfy water demands and growers must pump some private groundwater nearly every year, it is difficult to justify the expense of installing water meters because there will not be any water conservation. All surface water received will continue to be fully utilized. The use of water meters, however, would make it easier to equitably distribute the available water supply to all water users which would be a benefit, so the District is interested in exploring the installation of water meters at some point in the future.

For the District to fund a water measurement program on its own, the District would need to significantly raise assessments on District landowners. However the District does not have the authority to raise rates without going through a Proposition 218 election process, which requires a majority approval by landowners and may be difficult to obtain since the benefits of a water measurement program is hard to quantify. The District is willing to seek available grant funding to assist with additional measurement improvements.

The District considers that it has adequately implemented this EWMP.

Critical EWMP 2 – Volume Based Pricing

The District is a conjunctive use District with suitable, relatively shallow, and inexpensive groundwater. Keeping the cost of surface water low is critical for incentivizing growers to continue to utilize surface water. Presently water users supplement the available surface water supply with groundwater as needed, but if surface water becomes too expensive then some water users will stop using surface water. Considering the District typically is not able to deliver enough water to meet the seasonal irrigation needs of its water users and desires to maximize surface water deliveries in order to maintain groundwater conditions, price incentives on District water are not appropriate. All available surface water must continue to be utilized.

The District does not believe this EWMP is appropriate for a conjunctive use district such as Riverdale Irrigation District.

Conditional EWMP 1 – Facilitate Alternative Land Uses

The District has no lands with exceptionally high shallow water tables or whose irrigation contributes to on farm or recognized downstream drainage issues. In addition, Riverdale Irrigation District does not have the authority to impose land restrictions on landowners in the District.

No action on this EWMP is required.

Conditional EWMP 2 – Facilitate Use of Recycled Water

The District does not treat or recycle water. There is presently no water from municipal or industrial uses that is available to or delivered to the District. The District is open to discussing water supply issues with the communities within the District, including the possibility of accepting recycled water should those communities have acceptably treated water and need District assistance in disposing of, utilizing, or exchanging recycled water.

No action on this EWMP is required.

Conditional EWMP 3 – Facilitate Financing of Capital Improvements for On-Farm Irrigation Systems

The District does not have the funding necessary to facilitate such improvements, but supports NRCS and grower financing of such improvements. The District does, however, provide information to landowners regarding grant programs, low interest loans, energy efficiency programs, etc. that may be available from time to time. In areas where highly efficient irrigations systems such as drip/micro irrigation have been installed, the District encourages growers to continue to flood irrigate in above normal and flood years to help achieve groundwater recharge.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 4 – Implement an Incentive Pricing Structure

The current pricing structure of the District allocates available water on a per acre basis. Therefore, the price of the water increases in dry years because the landowners receive less water per acre. The price effectively decreases in wet years as there is more water available. In these years, surface water use is encouraged to offset groundwater pumping and aid with recharge for future dry years as the District is a conjunctive use entity. The District is implementing this EWMP by promoting conjunctive management of surface water and groundwater supplies by setting assessments and associated water rates below the cost of groundwater pumping to promote the use of surface water to provide direct and in-lieu recharge of the underlying groundwater system.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 5 – Line or Pipe Ditches and Canals

Most of the District's irrigation water is distributed in a system of open ditches with seepage from these ditches contributing to groundwater recharge. It is not appropriate for this EWMP to be implemented extensively as the surface water delivery system helps provide needed groundwater recharge for this conjunctive use system.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 6 – Increase Flexibility in Water Ordering and Deliveries

The District's delivery system works as a complete unit on an arranged rotation basis, and the District's Rules and Regulations outline the procedures for ordering and delivery of water. The water user is required to give the ditchtender assigned to his area at least five (5) days notice prior to the use of water, and the water user must specify the approximate flow rate in cubic feet per second he desires and the approximate length of time he will use the water (Rule 19). Once delivery of water is started for a water user, it is to run continuously night and day and through weekends until the water user is through with a specific water order (Rule 20). The water user must inform his assigned ditchtender at least three (3) full days ahead of the anticipated shutoff time. No water is to be physically shut off without first notifying the ditchtender or the office of intent to do so (Rule 21). In effect, one customer finishes irrigating and another is able to take that water and begin his irrigation. This minimizes the fluctuation of water and reduces the possibility of water loss. Any errors in shut off times by a customer can be compensated for with early start by another customer or temporary diversion to a District regulation reservoir as coordinated by the ditchtender.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 7 – Construct and Operate Spill and Tailwater Recovery Systems

Landowners are required by the District to maintain applied water on their lands. There are no direct spills from agricultural land into District facilities. The District has two regulation/recharge basins that can be utilized to capture any operational spills from the distribution system, and this short term stored water can then be returned to the system for reuse or allowed to percolate for groundwater recharge.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 8 – Optimize Conjunctive Use of Surface and Groundwater

The District has historically encouraged conjunctive use by its customers. The proximity to the Kings River, the soil types in the area, and the open canal system are all facets of conjunctive use in the District. The District could not survive without conjunctive use as its surface water supply is generally not sufficient to meet the water needs of its landowners. Most District water customers have access to private groundwater sources, which allows each customer to supplement the surface water supply with groundwater as needed.

The District considers that it has adequately implemented this EWMP, but will continue to look for additional groundwater recharge opportunities.

Conditional EWMP 9 – Automate Canal Structures

The District currently has a manually operated gate at the head of the Riverdale Ditch to control deliveries into the District, and check structures within the distribution system are currently manually operated. The District has evaluated the need for automated control structures within the District and determined that current operations do not justify the expense of automating control structures at this time.

The District considers that it has adequately implemented this EWMP and will continue to evaluate the feasibility of automating control sites within the District.

Conditional EWMP 10 – Facilitate Customer Pump Testing and Evaluation

While the District does not have technical staff available to implement this EWMP, pump testing and evaluation is locally available (and partially subsidized) through Pacific Gas & Electric's Advanced Pumping Efficiency Program administered by California State University, Fresno's Center for Irrigation Technology. The Kings River Conservation District continues to offer pump testing to those that pump groundwater within KRCD, including those within the District. The District helps facilitate customer pump testing and evaluations upon request.

The District considers that this EWMP is adequately implemented.

Conditional EWMP 11 – Designate a Water Conservation Coordinator

The District has designated Frank Thomas as water conservation coordinator. The coordinator will implement the water management plan and prepare progress reports as required.

Frank Thomas, Manager
Riverdale Irrigation District
21027 S Brawley Ave.
Riverdale CA 93656
(559) 867-3123 (office and fax)
riverdaleid@sbcglobal.net (email)

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 12 – Support Availability of Water Management Services to Water Users

While the District does not have technical staff available to implement this EWMP, water management services are locally available through the KRCD's Agricultural Water Enhancement Program, On-Farm Water Management Program, and its AgLine Information System. Assistance is provided with finding the most efficient and cost-effective use of water. Growers can schedule an appointment for a member of the KRCD staff to visit the location to review current irrigation practices.

The District considers that this EWMP is adequately implemented.

Conditional EWMP 13 – Evaluate the Need for Changes in Policies

The institution whose policies most directly affect the District is the Kings River Water Association (KRWA), which oversees Kings River entitlements and deliveries, and protects water quality while enhancing the environment. If an issue arises, the District works with the KRWA Watermaster to help find a solution within the governing policies of the Association. If this is not possible, the issue is brought before the Executive Committee of the Association for discussion and ruling. The District works well with the Association. An example would be in the water run to deliver irrigation water itself. The District has the ability to run water whenever the District needs to run. However, with the help of KRWA, each member unit is able to coordinate its water run with other KRWA members in order to reduce losses in the Kings River channel.

The District considers that it has adequately implemented this EWMP.

Conditional EWMP 14 – Evaluate and Improve Pump Efficiencies

The District does not currently own or operate groundwater pumps or lift pumps.

No action on this EWMP is required.

Evaluation of Water Use Efficiency Improvements

Quantifying the improvements in water use efficiency is difficult, or in some cases impossible, due to the complexity of the RID conveyance system, the variable annual water supply, and limited or lack of certain data needed for evaluations. However, a qualitative assessment using existing data in consideration of completed and proposed projects and/or policies is a more feasible approach in quantifying the magnitude of efficiency improvements. The Worksheet below discusses the qualitative improvements in water-use efficiency for each EWMP, indicating the 'improvements' in water use efficiency that have occurred in the recent past, or are anticipated to occur in the near future, and are qualitatively denoted as potentially "None", "Minor", "Moderate" or "Significant" with a brief explanation of each item. Some EWMPs are already making contributions to water use efficiency, but no changes have occurred recently or are anticipated in the future.

Worksheet 20. Report of EWMPs Efficiency Improvements			
EWMP No.	EWMP Description	Estimate of Water Use Efficiency Improvements in recent past	Estimated Water Use Efficiency Improvements 5 to 10 years in the Future
10608.48. b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.	Minor Flowmeters are not installed on each grower turnout, but ditchtenders are able to estimate deliveries made through each turnout	Minor Installation of flowmeters capable of measuring the volume of water delivered is being investigated and may be implemented in the future if funding is available. The anticipated benefit would be to equitably distribute water rather than conserve water.
10608.48. b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered	None The District does not currently have a volumetric pricing structure.	None The District does not see a benefit in implementing a volumetric pricing structure and it could be a detriment to using surface water.

Worksheet 20. Report of EWMPs Efficiency Improvements			
EWMP No.	EWMP Description	Estimate of Water Use Efficiency Improvements in recent past	Estimated Water Use Efficiency Improvements 5 to 10 years in the Future
10608.48. c(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage	None There is no need to facilitate alternative land use within RID. In addition, the District does not have authority to impose land restrictions on landowners in the District.	None
10608.48. c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils	None Currently there are no sources of available recycled water within the District.	None
10608.48. c(3)	Facilitate financing of capital improvements for on-farm irrigation systems	Minor District staff does assist facilitation of technical help with on-farm improvements. Growers are encouraged to seek NRCS funding of on-farm capital improvement projects.	Minor The District will continue the current program of offering assistance as needed.
10608.48. c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) more efficient water use at the farm level; (B) conjunctive use of groundwater; (C) appropriate increase of groundwater recharge; (D) reduction in problem drainage; (E) improve management of environmental resources; (F) effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Minor The current pricing structure of the District allocates available water on a per acre basis. Therefore, the price of the water increases in dry years because the landowners receive less water per acre. The price effectively decreases in wet years as there is more water available. In these years, surface water use is encouraged to aid with recharge for future dry years as the District is a conjunctive use entity.	Minor Continue with current program.
10608.48. c(5)	Expand line or pipe distribution system, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage.	Minor The unlined portions of the canal system are used for groundwater recharge which is needed in a conjunctive use district.	Minor Continue to utilize unlined canal system for groundwater recharge.

Worksheet 20. Report of EWMPs Efficiency Improvements			
EWMP No.	EWMP Description	Estimate of Water Use Efficiency Improvements in recent past	Estimated Water Use Efficiency Improvements 5 to 10 years in the Future
10608.48. c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	Minor The District delivery system operates as a complete unit. As one customer finishes irrigating then another is able to take that water and begin his irrigation. Any errors in shut off times by a customer can be compensated for with early start by another customer or temporary diversion to a District regulation reservoir. Any over irrigation contributes to groundwater recharge.	Minor Continue existing practices, allowing flexibility as much as possible.
10608.48. c(7)	Construct and operate supplier operational outflows and tailwater recovery systems	Minor The District has several existing regulation ponds that are used to collect excess water and eliminate spillage. The short term stored water can then be returned to the system for reuse or is used for groundwater recharge.	Minor Continue existing practices utilizing existing regulation ponds to capture and beneficially use water that otherwise would have spilled.
10608.48. c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Moderate RID is a conjunctive use district with the District delivering and recharging surface water and the landowners pumping groundwater as needed to supplement the surface water.	Significant (if funding is available) The District plans to construct or participate in recharge facilities as property and funding allow, for use in abundant water years to achieve groundwater recharge. Additional recharge is likely to be required to comply with SGMA.
10608.48. c(9)	Automate canal control structures	None The District does not currently have any automated control structures.	Minor The District plans to evaluate the need for automated controls within the distribution system, and assess any potential benefit.

Worksheet 20. Report of EWMPs Efficiency Improvements			
EWMP No.	EWMP Description	Estimate of Water Use Efficiency Improvements in recent past	Estimated Water Use Efficiency Improvements 5 to 10 years in the Future
10608.48. c(10)	Facilitate or promote customer pump testing and evaluation	None RID helps facilitate customer pump testing and evaluations upon request, which can lead to more efficient pumping by the water user and less energy use.	None Continue existing program.
10608.48. c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports	Minor A District staff member serves as the Water Conservation Coordinator and oversees water conservation measures and programs.	Minor Continue existing program.
10608.48. c(12)	Provide for the availability of water management services to water users.	Minor RID works in cooperation with the Kings River Conservation District to assist growers with implementing efficient and cost-effective measures to improve water management.	Minor Continue existing program.
10608.48. c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Minor The institution whose policies most directly affect RID is the Kings River Water Association (KRWA). The District cooperatively works with KRWA and other member units to resolve issues and manage water deliveries as efficiently as possible.	Minor Continue existing cooperative efforts.
10608.48. c(14)	Evaluate and improve the efficiencies of the supplier's pumps	None The District does not operate any groundwater wells or lift pumps.	None

Section VIII: Supporting Documentation

Agricultural Water Measurement Regulation Documentation (as applicable)

A. Legal Certification and Apportionment Required for Water Measurement - Lack of Legal Access to Farm-gate

The District does not currently measure water deliveries at the farm-gate (turnout), and measurement at the farm-gate would not result in any water savings since all available surface water is currently used and will continue to be used. The cost to implement a turnout measurement program has been determined to be unfeasible at this time, and would require an increase in rates that must be approved by voters in the District with no associated water conservation.

B. Engineer Certification and Apportionment Required for Water Measurement - Technically Infeasible

Measurement at the farm-gate is not technically infeasible, and in fact the District has considered utilizing propeller meters to more equitably distribute the available water supply. However, measurement at the farm-gate turnout is economically infeasible unless grant funding is available. The District currently measures water flow at periodic locations within the distribution system to aid in efficient water management.

C. Description of Water Measurement Best Professional Practices

District ditchtenders measure water level over weir boards on the upstream and downstream of laterals to determine the flow rate of water being diverted to a lateral. Experienced ditchtenders are also able to estimate the volume of water being delivered through a farm-gate turnout.

D. Documentation of Water Measurement Conversion to Volume

Ditchtenders can calculate the volume of a delivery by measuring the differences in water elevations and the turnout gate opening, using calibrated tables to compute the flow rate which corresponds to these parameters, and multiplying that flow rate by the recorded duration of delivery. The time component is manually recorded by the ditchtenders. This system is adequate to equitably deliver the allocated amount of water to each water user.

E. Device Corrective Action Plan Required for Water Measurement

The District will continue to pursue improved and appropriate measurement for a conjunctive use District, including but not limited to, additional flow measurement devices along the District laterals and acquisition of funding for turnout measurement.

Exhibit 1. Public Notifications

*RIVERDALE IRRIGATION DISTRICT
P.O. BOX 683
RIVERDALE, CA 93656
TELEPHONE & FAX – (559) 867-3123*

October 20, 2016

Augustine Ramirez
Fresno County Public Works & Planning
Development Services Division
2220 Tulare St., 6th Floor
Fresno, CA 93721

RE: Riverdale Irrigation District's Intent to Adopt an Ag Water Management Plan

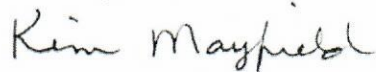
Dear Mr. Ramirez,

As you may know, Riverdale Irrigation District (District), as an Agricultural Water Supplier in California, is required to adopt an Ag Water Management Plan (AWMP) as set forth in SB X7-7, the Water Conservation Act of 2009. The District is currently working on the Plan.

As part of the AWMP and pursuant to Water Code S10821(a), the District is required to notify each city or county in which it supplies water for agricultural use that it will be preparing a plan. As our District supplies water in your county and we are preparing such a plan, you are hereby notified.

Please feel free to contact our office if you have questions.

Sincerely,



Kim Mayfield, Secretary
Riverdale Irrigation District

RIVERDALE IRRIGATION DISTRICT

PUBLIC NOTICE

Intent to Adopt a 2015 Agricultural Water Management Plan (AWMP)

A Draft 2015 Agricultural Management Plan can be reviewed at the Riverdale Irrigation District Office, located at 21027 S. Brawley Ave., Riverdale, CA.

Office Hours: Tuesday, Wednesday and Thursday 8:30 a.m. – 12:00 noon.

A public hearing will be held at 8:30 a.m. on November 9, 2016 at 21027 S. Brawley Ave., Riverdale, CA to review the Draft 2015 Agricultural Management Plan. Subsequent to the public hearing, the Riverdale Irrigation District Board of Directors at a public meeting will adopt the plan as presented, amend the plan or not take action on the plan.

Published: Selma Enterprise – October 26, 2016, November 2, 2016

Posted at RID Office: October 26, 2016

**A RESOLUTION BY BOARD OF DIRECTORS
OF
RIVERDALE IRRIGATION DISTRICT**

RESOLUTION NO. 2016-1

**AUTHORIZING THE ADOPTION OF THE RIVERDALE IRRIGATION DISTRICT'S
2015 AGRICULTURAL WATER MANAGEMENT PLAN DEVELOPED UNDER THE
AUTHORITY OF SB X7-7**

WHEREAS, Riverdale Irrigation District is located in Fresno County; and

WHEREAS, Riverdale Irrigation District did notice the County within Riverdale Irrigation District's boundaries of its intent to review, hold a public hearing and adopt Riverdale Irrigation District's 2015 Agricultural Water Management Plan; and

WHEREAS, Riverdale Irrigation District did notice pursuant to Government Code 6066 its intent for the public to review the Riverdale Irrigation District Agricultural Water Management Plan; and

WHEREAS, the Riverdale Irrigation District Agricultural Water Management Plan includes changes that are being contemplated in the near future, including for example: implementation of water banking facilities, strategies for mitigating climate change and drought, and implementation of water measurement at the turnout and volumetric pricing.

NOW, THEREFORE, BE IT RESOLVED, at a Special Board Meeting held on November 9, 2016, Riverdale Irrigation District did consider all comments and adopted the Riverdale Irrigation District 2015 Agricultural Water Management Plan developed under applicable law and Executive Orders. By taking this action, it is Riverdale Irrigation District's intent to demonstrate its long-term commitment to water management and conservation.


NOW, THEREFORE, BE IT FURTHER RESOLVED, that Riverdale Irrigation District did adopt the Riverdale Irrigation District Agricultural Water Management Plan on November 9, 2016 as submitted, by the following vote:

AYES: Directors Leonard Acquistapace, Tony Fontes, and Ralph Hodson

NAYS: None

ABSTAIN: None

ABSENT: None


Leonard Acquistapace, President



Kim Mayfield, Secretary

Exhibit 3. District Location Map

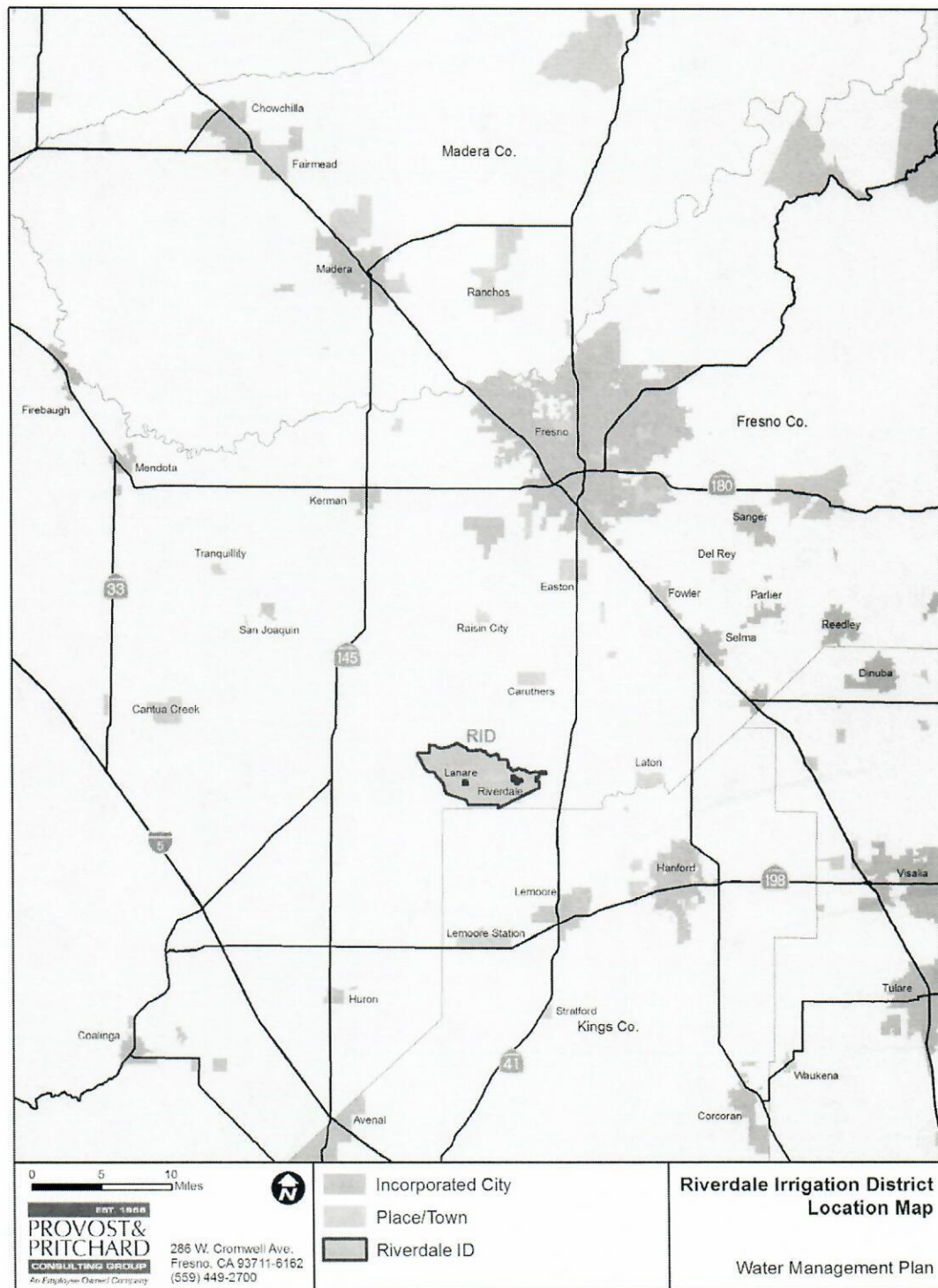


Exhibit 4. District Distribution System Map

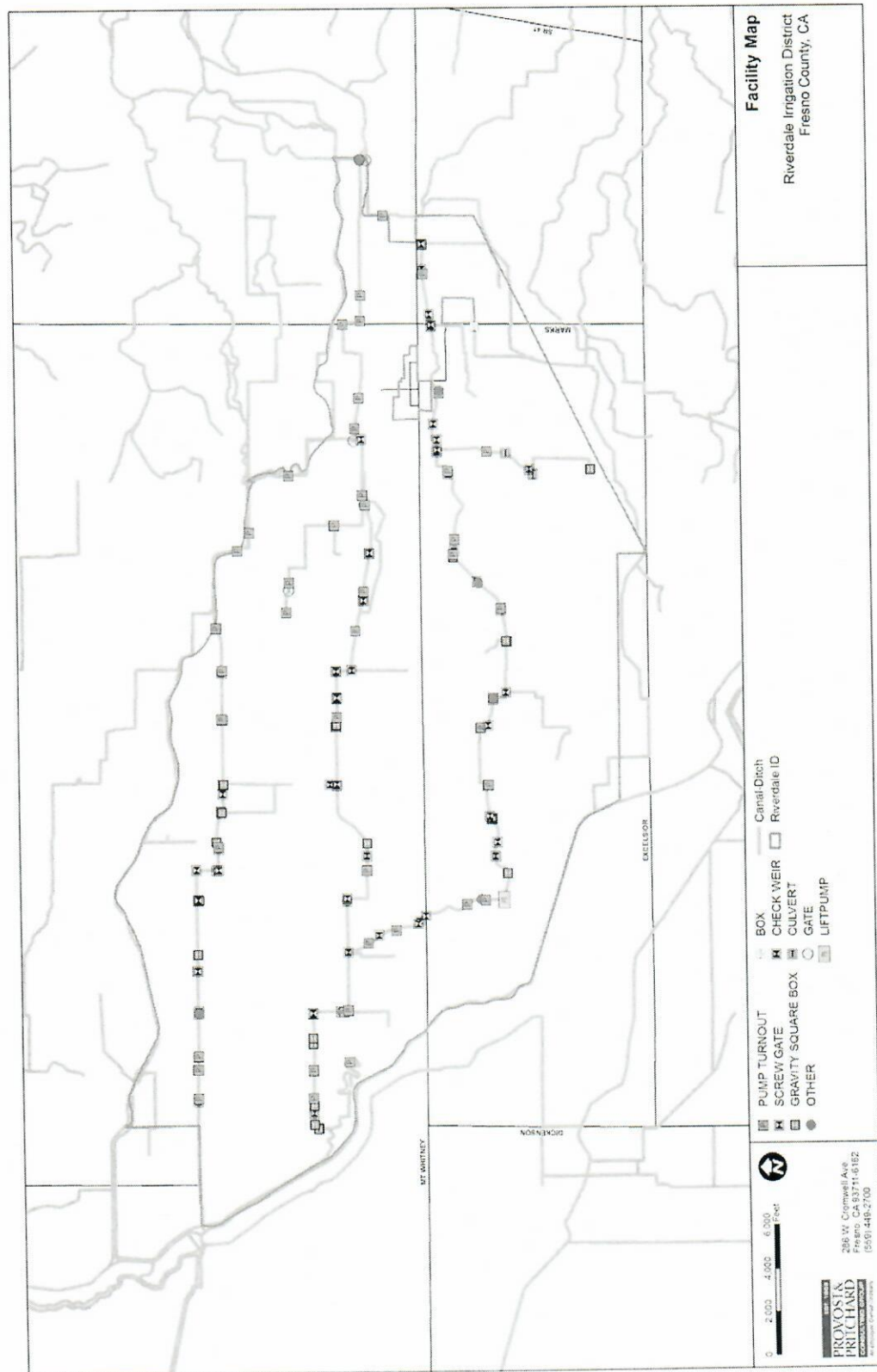


Exhibit 5. District Soils Map

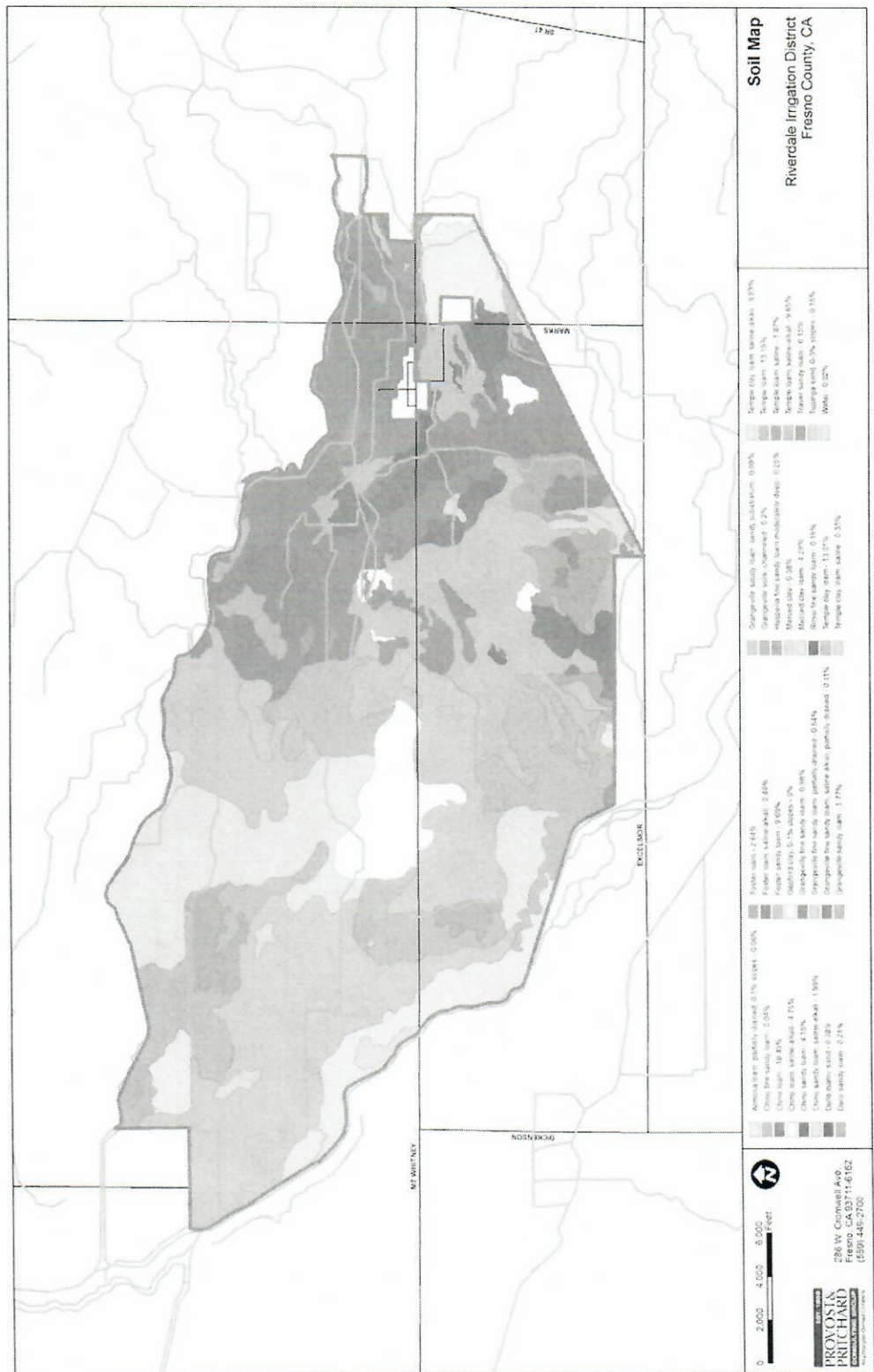
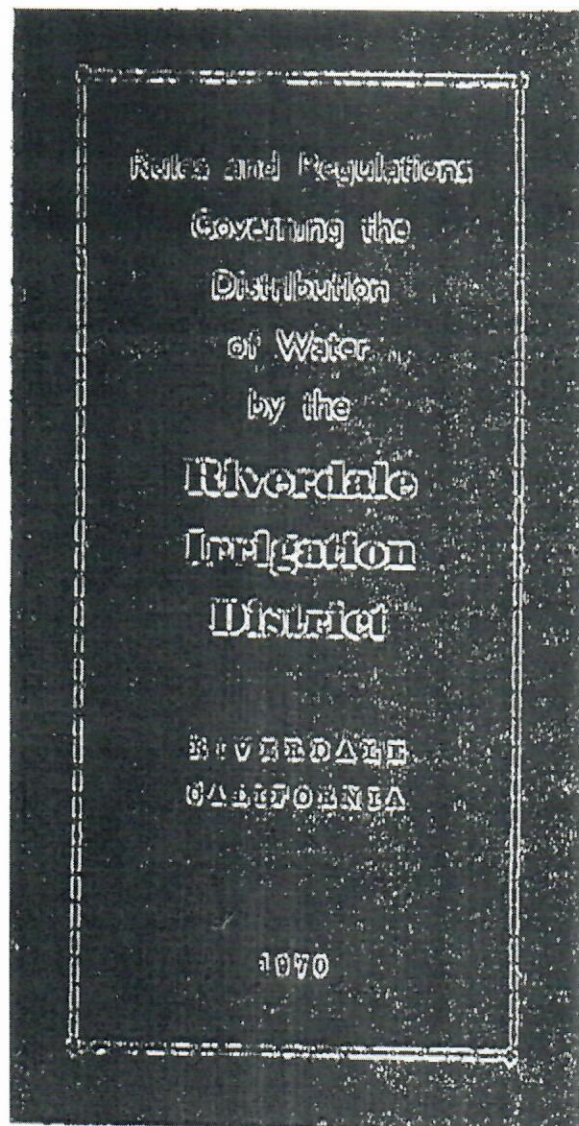


Exhibit 6. District Operating Rules and Regulations



RIVERDALE IRRIGATION DISTRICT

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**RIVERDALE IRRIGATION DISTRICT
RULES AND REGULATIONS GOVERNING
THE DISTRIBUTION OF WATER BY THE
RIVERDALE IRRIGATION DISTRICT**

Adopted: SEPTEMBER 1, 1970

Superceding and cancelling all rules and regulations governing the distribution of water heretofore made.

1. MANAGEMENT

The District is under the exclusive management and control of the Board of Directors.

2. SUPERVISION

All matters relating to the distribution and use of water shall be under the general charge of the Manager acting under the authority conveyed by and with the approval and supervision of the Board of Directors.

**3. COMBINING ACCOUNTS AND WATER
TRANSFERS**

Water allocated to one landowner for the current season cannot be transferred in or combined with another landowner's account without a signed form making provisions for such transfer, being approved by the District and filed in the District's Office. Such form shall specify the amount of water being leased or transferred and the description of land where it will be used. Such forms are to be approved by the Board of Directors prior to combining accounts or running water. No water may be used on or transferred to land upon which a Certificate of Sale to the District has been issued.

4. NO OVERDRAFTS ALLOWED

There will be no overdrafts of water.

5. AVAILABILITY OF WATER

The ditchtender will inform the water user of the approximate time the water will reach his land. To do this the Ditchtender will have to depend on the time of irrigation estimated by the preceding water user. Close cooperation between water users and ditchtender is necessary to get satisfactory results.

The ditchtender will avoid excessive ordering in and out of water. Cuts must always be excluded to keep a steady flow and especially so during the weekends.

6. ACREAGE OF CROPS

Between January first and June first of each year, the ditchtender will obtain from each user of water, a signed statement of the kinds of crops and number of acres of each which he intends to irrigate. Such other information as may be desirable may be obtained on the same form.

7. CONDITION OF LAND AND DITCHES

All land to which water is to be delivered must be properly checked and leveled and kept properly checked and leveled and prepared in such a manner that the same may be easily and economically irrigated. The ditches and other conduits for conveyance of water serving the same must be kept clean and in such condition and so constructed that the water will flow freely and easily through the same without waste. The irrigation gates and other structures on private laterals must be constructed and maintained so as to prevent waste and leakage.

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8. IRRIGATION OF EXCESSIVELY HIGH GROUND

The District will not be required to raise water to an unreasonable elevation in canals or ditches in order to give service to lands or ditches of unreasonable elevation.

Such unreasonable elevation shall be determined by conditions which would jeopardize the District ditches, and which would interfere with water users' service.

9. RIGHT TO STOP FLOW

The District reserves the right to stop the flow in any channel or ditch at any time the Manager or the Board of Directors may determine such action to be necessary.

10. RIGHTS-OF-WAY

No fences, ditches, or other obstructions shall be placed across, upon or along any bank or levee of any canal or ditch belonging to the District without the written permission of the Board of Directors.

Right-of-way for canals and ditches belong to the District and include, in addition to the ground actually occupied by the canal or ditch, such lands, on both sides thereof, as are reasonably necessary for the operation and maintenance of such canals and ditches.

Ditch banks shall not be removed, changed, plowed, cultivated, farmed or interfered with in any manner except by prior permission of the Manager.

11. ACCESS TO LANDS

The authorized agents or employees of the District shall have free access at all times to all lands irrigated from the District system for the purpose of maintaining or examining the

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ditches and the flow of water therein.

If the District holds a right-of-way or easement across private land for the operation of a canal or other facility, the law provides that the District shall have certain secondary rights and easements, such as the right to enter upon the property upon which the right of way or easement is located to make repairs and do such other things as are necessary for the full exercise of the easement rights.

12. CHANGES IN DISTRICT DITCHES

No change in location or other alterations of any District ditch will be made without prior written approval of the Board of Directors. Right-of-way agreement and engineering must be prepared in advance of any work being accomplished. Failure to comply with this rule may result in the refusal of the District to accept new facilities in exchange for those now in operation and to cause the restoration of any District ditches and/or facilities removed.

13. BRIDGES OVER CANALS AND LATERALS

Private bridges over District canals are constructed and maintained by the owners of land adjoining the canal who require the bridge, after obtaining written permission from the Board of Directors.

If any bridge becomes dilapidated as a result of age or other causes so that it is a threat or menace to the safe operation of the canal it spans, the District reserves the right to remove the bridge at the expense of the owner.

14. PUMPING AND DRAINS TO DISTRICT DITCHES

No pumping shall be permitted and no openings shall be made, or irrigation gates or drainage gates placed in any bank or District canals or ditches for drainage purposes. Permission will not be granted to drain dairies, other livestock

operations or sewer affluent into District's canals.

15. PUMPING RULES

All users pumping water from the canals shall be governed in all respects by the rules and regulations applicable to users under gravity service.

16. DUTY OF WATER USERS

It is hereby declared that it shall be the duty of each water user in the Riverdale Irrigation District to regulate the amount of water in use or to be used for irrigating crops on lands within the area so as to avoid damage to adjacent lands from seepage, from overflow or drainage from such irrigation.

17. DUTY OF ABSENTEE LANDOWNER

Absentee landowners and water users who are away from the land when water is made available by the ditchrider must have an irrigator on the land to take the water.

18. WASTE OF WATER

User wasting water, either willfully, carelessly or on account of defective or inadequate preparation of the land for irrigation, may be refused further service unless such conditions are remedied immediately upon notice given by the Manager or authorized District agents, and no water may be taken or used outside the boundaries of the District.

19. REQUEST FOR WATER

The water user is required to give the ditchrider assigned to his area at least five (5) days notice prior to the use of the water. User must specify approximate head in cubic feet per second he desires and approximate length of time he

will use the water.

If the water user fails to use the water during the period requested by him it shall not afford any basis for any claim to use without giving the regular five (5) day's notice unless such failure to use be due to unavoidable emergencies, or if the irrigation is begun and then discontinued because of unavoidable circumstances. In either of these unavoidable cases the ditchtender shall diligently endeavor to deliver water to the user or landowner insofar as it can be done without interference with the delivery of the water in general. Provided, however, that the water user in such emergencies must give all the notice possible thereof to the ditchtender or the office.

20. RUNNING OF WATER

Once delivery of water is started for a user, it is to run continuously night and day and through weekends until user is through with a specific water order.

21. TURNING OFF WATER

(a) The water user must inform his assigned ditchtender at least three (3) full days ahead of his anticipated shutoff time. No water is to be physically shut off without first notifying the ditchtender or the office of intent to do so. Violations of these provisions may result in the user being charged with water ordered.

(b) Water users who, by opening, closing or otherwise interfering with regulating gates or devices, cause any fluctuations in the flow of the ditches or canals and thereby causing any breaks in such canals or ditches, or any damage of any kind whatsoever, shall be responsible to the District for the whole of the expense and damage caused thereby, except where regulation is made on instructions or requests of the District ditchtender or in case of emergency.

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22. LIABILITY OF WATER USER

Every irrigator shall be responsible for any damage occasioned or caused by the negligent or careless acts of the water user and/or his employee. When water is turned to him he shall be held responsible for this water and for the patrolling of the private ditch from the time it leaves the District's lateral.

23. DISTRICT LIABILITY

Nothing herein contained shall be construed as an assumption of liability on the part of the District, its Directors, Officers, or Employees, for damage occasioned from the use of water by any water user.

The District will not be liable for any damage caused by the negligence or carelessness of any consumer in the use of water or for failure on his part to maintain any ditch for which he is wholly or in part responsible.

A shortage of water may occur from time to time in the quantity available to the District. In no event shall any liability accrue against the Riverdale Irrigation District, or any of its officers, agents, or employees for any damage arising directly or indirectly from or because of miscalculations in estimating needs, deficiency of water supply, drought or other causes.

24. PENALTY FOR NON-COMPLIANCE

Refusal to comply with the requirements hereof or transgression of any of the foregoing Rules and Regulations, may be sufficient cause for shutting off the water, and water will not again be furnished until full compliance has been made.

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**25. LIABILITY OF PERSONS INTERFERING
WITH REGULATION OF WATER OR
TAKING OF WATER WITHOUT NOTIFYING
DITCHTENDERS**

Any person who uses water without authority is subject to criminal prosecution.

Section 592 of the Penal Code of California is as follows:

**"WATER DITCHES, ETC., PENALTY FOR
TRESPASS OR INTERFERENCE WITH....**

Every person who shall, without authority of the owner or managing agent, and with intent to defraud, take water from any canal, ditch, flume or reservoir used for the purpose of holding or conveying water for manufacturing, agricultural, mining, irrigating or generation of power or domestic uses or who shall without like authority, raise, lower or otherwise disturb any gate or other apparatus thereof, used for the control or measurement of water, or who shall empty or place, or cause to be emptied or placed, into any such canal, ditch, flume, or reservoir, any rubbish, filth or obstruction to the free flow of the water, is guilty of a misdemeanor." and Section 4175 of the Water Code provides:

"Every person who wilfully and without authority closes, changes, or interferes with any headgate, waterbox, or measuring device or who wilfully takes or uses water which has been denied him is guilty of a misdemeanor."

Under such statutes persons interfering with the regulation of water in the canals and ditches are subject to prosecution.

If any person takes water at any time without permission of the ditchtender, he may be subject to such criminal prosecution.

BY ORDER OF THE BOARD OF DIRECTORS

Riverdale Irrigation District

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